Wisconsin
Department of Commerce

Evaluation # 200249-M (Replaces 980028-M)

Safety & Buildings Division
201 West Washington Avenue
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Wisconsin
Building Products Evaluation

Material	Pre-Engineered Metal Building Systems
Manufacturer	Nucor Building Systems 305 Industrial Parkway Waterloo, IN 46793

SCOPE OF EVALUATION

GENERAL: This is a review of the methodology used for structural performance calculations for a **"standard building package"** system. The review evaluates certain pre-engineered metal building systems manufactured by Nucor Building Systems, specifically the Tapered Beam Frame-TB, Clear Span Rigid Frame-RF, and Rigid Frame w/Interior Column Frame-RFC systems. See **LIMITATIONS OF APPROVAL** section for a clarification note on "Standard Building Package".

NOTE: Structural calculations shall be submitted in accordance with IBC Chapter 16 (Live, Ground Snow, Roof, Wind, and Seismic Loads) for ALL building submittals.

This review includes the cited **International Building Code (IBC)** requirements below in accordance with the current **Wisconsin Amended IBC Code:**

- **Structural:** The Tapered Beam Frame-TB, Clear Span Rigid Frame-RF, and Rigid Frame w/Interior Column Frame-RFC systems were evaluated in accordance with **ss. IBC 1603.1, 1604.1, 1604.2, 1604.3.1, 1604.3.3, 1604.4,1604.5, 1605.1, 1606** through **1609, 2208.1 [Comm 62.2208], 2209.1, 2209.2** and **2211.5.**

  Nucor's metal panel roof system performance requirements shall be in accordance with **ss. IBC 1504.1, 1504.3, 1504.3.1, 1504.3.2, 1504.5** and **s. IBC 1504.6**.

- **Fire classification:** Nucor's metal roof panel system is a Class A assembly in accordance with **s. IBC 1505.3**.
- **Roofing:** The Nucor metal roof panels shall be installed in accordance with the requirements of **s. IBC 1507.4** through **s. IBC 1507.4.4**.

  When re-roofing with Nucor's building metal roof panels, installation shall be in accordance with **s. IBC**

1510.1 through **s. IBC 1510.4**. Nucor's roof covering materials shall be identified in accordance with **s. IBC 1506.4**.

DESCRIPTION AND USE

General: The Nucor pre-engineered metal building systems include Tapered Beam Frame-TB, Clear Span Rigid Frame-RF, and Rigid Frame w/Interior Column Frame-RFC. The structures may have straight, or tapered columns, varying roof slopes and interior columns symmetrically or unsymmetrical placed, by-pass or inset girts, purlins, simple span or continuous design. They are structures of varying widths, lengths and bay spacing. Connections are field-bolted. Wind bracing cable-rods, angles or horizontal and vertical Pratt trusses are used. Covering (roof and wall panels), and cold-formed section sizes are covered in the section properties and specifications. All materials are designed per the current editions of AISI or AISC.

PRIMARY STRUCTURAL MEMBERS:

1. **TAPERED BEAM FRAME BUILDINGS - TB**
   Clear span, straight column, gable or single slope building with by-pass or inset girt.
   Building Parameters: width ...……20'-60'
   eave height .....…10'-16'
   bay spacing ..... 20'-30'
   roof slope…….1/4:12-1:12

2. **CLEAR SPAN RIGID FRAME BUILDINGS – RF**
   Clear span, taper column, gable or single slope building with by-pass or inset girt.
   Building Parameters: width ……...40'-200'
   eave height ……12'- 30'
   bay spacing …….20'- 30'
   roof slope……1/2:12 to 4:12

3. **RIGID FRAME WITH INTERIOR COLUMN FRAME BUILDINGS - RFC**
   Multiple span, taper column, gable or single-slope building with by-pass or inset girt.
   Building Parameters: width .....……80'-500'
   span .....……40'- 100'
   eave height .....…12'- 30'
   bay spacing .....…20'- 30'
   roof slope .....…..…1/4:12-1:12

All primary steel, built-up sections are manufactured from 36, 50 or 55 KSI minimum yield steel, designed in accordance with AISC-ASD 9th Edition Specifications.

The design and assembly of structural joints and connections (primary and secondary steel) using high strength steel bolts conform to the "specification for structural joints using ASTM A325, A490 and A307 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.

SECONDARY STRUCTURAL MEMBERS: The purlin and girt cold-formed z-sections are 8 inches or 10 inches deep. The steel material is 55 KSI minimum yield. The eave struts are cold-formed 8 inches or 10 inches deep sections. The steel material is 55 KSI minimum yield: 0.060-, 0.068-, 0.076-, 0.085-, 0.098-, or 0.105-inch thick.

Standard bearing-frame endwall rafters and columns are built-up, hot rolled, and/or cold rolled shapes, 36, 50 or 55 KSI minimum yield steel. Expandable endwall frames are built-up shapes of 55 KSI minimum yield steel.

All secondary structure is designed in accordance with AISI Specification for the Design of Cold Formed Steel Structural Members, 1996 Edition, with 1999 Addendum.

BRACING: A positive bracing system designed to resist longitudinal loads caused by wind, earthquake, frame stability forces, cranes and other moving equipment is provided. Discrete load paths are provided from the point of load application to the building foundation. Load distribution between multiple bays of bracing is accomplished by considering the relative stiffness of the braced bays.

Typical bracing configurations consist of horizontal and vertical Pratt trusses. The trusses are located in the plane of the roof and sidewalls. The truss chords are the rafters and columns of the frames at the braced bay. The purlins, girts and eave members act as the vertical "web" members of the truss. The axial loads applied to these members by the bracing system are taken into account in their design. The diagonal "web" members of the truss will be one of the following components:

- High-strength cable bracing is used when rod bracing load capacities are exceeded. Cable bracing is not used in seismic controlled conditions or with crane systems.
- Angle bracing is used when rod-bracing capacities are exceeded.

CLADDING MATERIAL: Translucent panels have the "CLASSIC" profile and can resist 33 psf loading a 5-foot span. This panel is not intended for the support of direct foot traffic, and should not be walked on. All steel cladding material is designed in accordance with 1996 Edition "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members" - AISI.

TRIM AND FLASHING: Color coated trim and flashing shall be 26 gauge. Trim shall be provided at eave, ridge, rake and where necessary to insure a properly constructed building. Trim and flashing shall be attached with stitch fasteners with a maximum spacing of 12" on center.

FASTENERS: Panel to structural fasteners for roof shall be a No. 12 self-drilling carbon steel LONG-LIFE screw, hex washer head with sealing washer, 1-1/4" long. Fastener shall have a 20-year corrosion resistant coating and shall have a painted head to match panel and/or trim color. Panel to panel, flash to flash, (stitch) fasteners for roof shall be a 1/4" self-drilling carbon steel screw, hex washer head with sealing washer, ¾-inch long. Fastener shall have a 20-year corrosion resistant coating and shall have a painted head to match panel and/or trim color. Fasteners required for securing trim to masonry or concrete are not supplied by Nucor Buildings Systems.

TESTS AND RESULTS

Structural calculations for the "Standard Building Package" were prepared by Ronald K. Kuenkler, WI P.E., Waterloo, Indiana, for Nucor Building Systems, dated August 9, 2002 and were submitted to the department.

Metal panel roof system performance: ss. IBC 1504.3, 1504.3.1, 1504.3.2, both the Classic™ profile (through-fastened) and the CFR™ profile (standing seam) have been tested and certified under UL 580 testing. All of the CFR™ panel systems have been designed for uplift using ASTM E1592 test values.

In accordance with **s. IBC 1505.1** and **1505.2** the CFR™ standing seam profile roof panel system has been tested and certified as a Class A assembly under ASTM E108. The installation of Nucor's metal roof panels: **s. IBC 1507.4** through **s. IBC 1507.4.4**, meet these requirements with exceptions with respect to material. The pre-painted CFR™ product: ASTM A792 GR50; the pre-painted Classic™ product: ASTM A653 GR50; the unpainted CFR™ product: ASTM A792 GR50 AZ55; and the unpainted Classic™ product: ASTM A792 GR80 AZ55.

Note: The minimum slope for standing seam roof systems shall be ¼:12 and the minimum slope for lapped and caulked metal roofs shall be ½:12, as stated in **s. IBC 1507.4.2**.

LIMITATIONS OF APPROVAL

This evaluation is for a **"Standard Building Package"**: Tapered Beam Frame-TB, Clear Span Rigid Frame-RF, or Rigid Frame w/Interior Column Frame-RFC. Sample calculations are on file with the department (an approval of the methodology used for structural performance calculations). **The metal building will be constructed in accordance with the submitted calculations that shall be submitted on a job-to-job-basis.**

Clarification Note: "Standard Building Package" is the submitted calculation package reviewed as part of the building product approval process that **uses an assumed set of loading conditions** for the state of Wisconsin. This does not relieve the designer from submitting calculations for each project, even when the "standard building package" is what will

be constructed. **Whether the "standard building package" design and construction details are modified or not, based on different loading conditions at a site, calculations shall be submitted on a job-to-job basis**.

The **"Standard Building Package" does not have** mezzanines, cranes or rooftop units, and drift or unbalanced loads from existing buildings.

INFORMATION REQUIRED ON COMPONENT PLANS SUBMITTED FOR APPROVAL

The approval number, member properties, sizes of all members, layout and other general requirements of **s. Comm 61.30** must be indicated on each plan submittal. **Note: Member sizes may be shown in the building plan submittal or subsequent structural component plan submittal.**

The component plans/calculations shall also list the loading conditions, exposure coefficients, and importance factors for the building plan reviewer verification.

Foundation plans shall be submitted with the building plans. The plans shall show details of footings, anchor bolt sizes, hairpin and side thrust restraint information.

The location and size and critical dimensions of all primary structural members (rigid frames, columns, beams, end walls, etc.) must be shown on the plans, this will include web and flange sizes at the base, haunch, ridge and any other location where member sizes change.

The size and spacing of secondary structural members (girt and purlin, eave strut, etc.) shall be shown on cross-sections, roof plans and framing elevations.

The size and location of all diagonal bracing must be shown on structural plans and elevations.

This approval will be valid through December 31, 2007, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The Wisconsin Building Product Evaluation number must be provided when plans that include this product are submitted for review.

DISCLAIMER

The department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement not specified in this document.

Revision Date:
Approval Date: January 30, 2003 By: _____

Lee E. Finley, Jr.
Product & Material Review
Integrated Services Bureau

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